Extending Aircraft Range via Use of Pressurized Onboard Fuel Tanks and Flexible Hydrocarbon Molecules

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Simon Edwards
Research Acceleration Initiative

Introduction

While weight is a limiting factor dictating the amount of fuel that an aircraft may carry, increasingly powerful engines now make it possible for aircraft to take off with increased weight, making the primary limiting factor the volumetric capacity of fuel tanks.

Increasing the volumetric capacity of aviation fuel tanks generally means increasing the size and therefore the aerodynamic drag on aircraft. If fuel capacity could be increased through pressurization and sufficient thrust could be generated to overcome the added weight, volumetric limitations would cease to be a significant factor and the space previously occupied by fuel tanks could either be utilized for other purposes or the size may be kept the same so that aircraft may enjoy substantially extended range, mitigating the need for frequent airborne refueling.

Abstract

The wide variety of molecular configurations in which hydrocarbons may be structured lends itself to the possibility of the design of aviation fuels that fold into compact, accordion-like shapes when pressurized. Such molecules could be designed so as to occupy, perhaps, one fifth of the space they would when unpressurized. Pressurized fuel systems would have as a benefit that they would largely eliminate the need for fuel pumps to be used in order to spray fuel into combustion chambers with the innate pressure inside the tank being more than adequate for this purpose.

Forces of mutual repulsion of pressurized molecules would be attenuated by way of much of this force being internally coiled within the condensates (these would manifest themselves as clumps of chained hydrocarbons) with these molecules exerting forces associated with mutual repulsion against themselves rather than against their neighboring condensates. This would have the effect of not only allowing more fuel to be fit into a small space, but reducing the effective stress exerted on the storage tanks. In such a system, when fuel is pumped into the system with accompanying pressure, the pressure would briefly increase to an extraordinary level and then decrease as a result of the spontaneous formation of hydrocarbon condensates; a consequence of the specialized design of the base molecules.

This would mean that if a tank could withstand extreme pressures for brief periods of time, it would not need to withstand those peak pressures for more

than a few moments during the fueling process, at which point, a dramatically lower effective pressure level would be measured.

Taking the theory to its logical conclusion, this may mean that a fueling process that is designed to be painfully slow might enable the fueling of an aircraft with a much as ten times its ordinary capacity of fuel by weight, provided that the aircraft may safely remain in a fully fueled state. In either the case of a 5x increase or a 10x increase in fuel weight, particularly given the weight of ordnance (particularly in the case of bombers) increased thrust would be required in order to enable an aircraft to take off.

One advantage of such a system is that a tank might be unpressurized at takeoff and pressurized in mid-flight. An aircraft that is already airborne could carry substantially greater amounts of fuel if it did not need to contend with that weight during the takeoff process. It is also worth noting that the amount of thrust that could be generated from hydrocarbon condensates may far exceed that of standard aviation fuel given that a greater number of protons would be released in closer proximity to one another upon combustion.

Conclusion

Provided that such a system is feasible, designing engine housings capable of withstanding increased heat would be required. Nonetheless, this would be a relatively modest investment given the potential benefits of, perhaps, tripling aircraft range.